DOCUMENT RESUME

ED 186 250 SE 030 629

AUTHOR Mills, Stephen R.: And Others
TITLE The Design of Environmental Education Delivery Systems: A Procedural Guide.
INSTITUTION Far West Lab. for Educational Research and Development, San Francisco, Calif.
SPONS AGENCY Office of Education (DHEW), Washington, D.C. Office of Environmental Education.
PUB DATE Sep 79
GRANT G007802598
NOTE 50p.: For related document, see SE 030 630. Page iv of the original document is missing.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Conservation Education: *Curriculum Development; Delivery Systems; Educational Administration; Educational Assessment: *Educational Innovation; *Educational Planning: *Educational Supply; Elementary Secondary Education; *Environmental Education: Interdisciplinary Approach; *Needs Assessment: Planning: Systems Approach

ABSTRACT

This guide is intended to facilitate implementation and infusion of environmental education (EE) programs by presenting guidelines for design of a system. The operations leading to the system and its evaluation are discussed. Two components of the design of the system are specifically treated: (1) EE delivery concerns, and (2) levels of planning. This guide answers several questions including: (1) What is a useful approach to the design of an EE delivery system; (2) What are the major instructional goals and learning objectives for an EE curriculum; (3) What are the basic requirements for delivering an EE program; (4) What are some possible constraints and barriers to delivering an EE program; (5) What are some basic strategies and tactics that facilitate EE program delivery; and (6) What are some important considerations in evaluating an EE delivery system? (Author/RE)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

A
PROCEDURAL
GUIDE

ED186250

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Bela H. Banathy

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

THE DESIGN OF ENVIRONMENTAL EDUCATION DELIVERY SYSTEMS

FAR WEST LABORATORY FOR EDUCATIONAL RESEARCH AND DEVELOPMENT
1855 FOLSOM STREET · SAN FRANCISCO, CALIFORNIA 94103 · (415) 565-3000

SE 030 629

THE DESIGN OF ENVIRONMENTAL EDUCATION DELIVERY SYSTEMS:

A PROCEDURAL GUIDE

BY

STEPHEN R. MILLS

BELA H. BANATHY

CATHY E. AARON

Grant No. G007802598

September 1979

The activity which is the subject of this report was supported by the United States Office of Education, Office of Environmental Education. However, the opinions expressed herein do not necessarily reflect the position or policy of the United States Office of Education, the Office of Environmental Education, or the Far West Laboratory for Educational Research and Development, and no official endorsement by these agencies should be inferred.

Submitted to the
Office of Environmental Education
United States Office of Education
Washington, D.C. 20202

ACKNOWLEDGEMENTS

In producing this document, the authors would like to acknowledge the contributions of the following persons:

Our Co-Designers

William Hammond (Lee County Schools, Florida)
Lola Hanson (Council Grove III Community School, California)
Martin Heatherington (Michigan State University)
John Miller (Minnesota Department of Education)
Lawrence Schaefer (Area Cooperative Educational Services, Connecticut)
Herbert Wong (Berkeley, California)

Our Review Panel

Walter Bogan (Office of Environmental Education, Washington, D.C.)
Jacqueline Haveman (Far West Laboratory)
Louis Rubin (University of Illinois)
John Thomas (Research for Better Schools/Far West Laboratory)
John Warfield (University of Virginia)

Our Production Staff

Secretarial Support: Charlie Ray Altizer, Carol Burkhart, Marcia Petty, and Marilyn White

PREFACE

Supported by a grant from the Office of Environmental Education (U.S. Office of Education), the Far West Laboratory for Educational Research and Development has developed a set of resources applicable to the institutionalization of environmental education and, more specifically, to the design of environmental education delivery systems.

The development in this project of resources for the design of environmental education delivery systems responded to a need identified in the Environmental Education Act (Public Law 91-516; Public Law 93-278 as amended) for facilitating changes in user institutions and organizations that lead to the adoption, installation, and use of effective environmental education programs and curricula.

The resources developed by the project include:

- The Institutionalization of Environmental Education in the Formal Education Sector: A Generic Model
- The Design of Environmental Education Delivery Systems: A Procedural Guide
- Case Studies of the Institutionalization of Environmental Education.
- A Final Report

An essential aspect of the project was the involvement of educational practitioners in the research and development process. This was accomplished through the cooperation and participation of individuals representing various school districts, state departments of education, universities and colleges, and educational research and development (R&D) and service agencies.

This document presents a Procedural Guide for the design of an environmental education delivery system. In this Procedural Guide we:

TABLE OF CONTENTS

	Page
PREFACE	iii
INTRODUCTION	vii
KEY TERMS	ix
CHAPTER ONE: A PERSPECTIVE ON DESIGN	1
A. Basic Approaches to Designing an EE Delivery System	1
B. The Process of Designing an EE Delivery System	3
CHAPTER TWO: SPECIFYING AN IDEAL ENVIRONMENTAL EDUCATION CURRICULUM	7
A. Major Instructional Goals of Environmental Education	8
B. Types of EE Learning Objectives Compatible with the Major Goals	8
C. Environmental Education Curriculum Options	9
CHAPTER THREE: SPECIFYING PROGRAM REQUIREMENTS	11
A. Types of Program Requirements	11
B. Ways to Organize and Specify Program Requirements	13
CHAPTER FOUR: IDENTIFYING BARRIERS AND CONSTRAINTS	17
A. Barriers	18
B. Constraints	19
CHAPTER FIVE: SELECTING DELIVERY STRATEGIES AND TACTICS	21
A. General Types of Strategies and Tactics	22
B. Considerations in Selecting Strategies and Tactics	24
CHAPTER SIX: EVALUATING AN EE DELIVERY SYSTEM DESIGN	31
A. Some Preliminary Evaluation Considerations	32
B. General Questions for Assessing the Adequacy of each Step of the EE Delivery System Design Process	33
C. General Questions for Assessing the Overall Quality of the EE Delivery System Design	37
SUMMARY	41

INTRODUCTION

The purpose of this guide is to facilitate the implementation and infusion of useful environmental education (EE) programs* in school systems by assisting educational practitioners to design a system that has the capability to deliver EE curriculum content, instructional capabilities, instruction and learning resources, administrative support, and program management capabilities required to conduct environmental education in targeted educational settings. To achieve this purpose, the guide will describe the operations that must be accomplished to design an EE delivery system and to evaluate the quality of that design.

In the Generic Model, we characterized the major components for designing an EE delivery system that included considering EE stakeholders, stages of institutionalization, EE delivery concerns, and levels of planning. In this document, we will provide a more detailed examination of two of these components--EE delivery concerns (i.e., ideal EE curriculum image, program requirements, constraints and barriers, delivery strategies and tactics, and evaluation) and levels of planning (i.e., school board/district support, program management, curriculum, instruction, and learner experiences).

The Procedural Guide will focus on delivery concerns and levels of planning to emphasize their importance as ways of thinking about EE delivery and as a basis for designing and developing an EE delivery system. Furthermore, our approach to addressing levels of planning through delivery concerns exemplifies the interrelatedness of these two design components and demonstrates a systematic method for dealing with their complexities.

---

*As defined by the Environmental Education Act of 1970 (Public Law 91-516; and as amended in 1974 by P.L. 93-278).

As a resource document, the Procedural Guide is designed to provide answers to the following questions:

- What is a useful approach to the design of an EE delivery system? What are the basic operations and steps involved in such a design? (Chapter One)
- What are the major instructional goals and learning objectives for an EE curriculum? What are some EE curriculum options? (Chapter Two)
- What are the basic requirements for delivering an EE program? What are some systemic ways to think about and specify program requirements? (Chapter Three)
- What are some possible constraints and barriers to delivering an EE program? (Chapter Four)
- What are some basic strategies and tactics that facilitate EE program delivery? What are some important decision criteria for selecting strategies and tactics? (Chapter Five)
- What are some important considerations in evaluating an EE delivery system? How can the adequacy and quality of an EE delivery system design be assessed? (Chapter Six)

KEY TERMS

Comprehensive Environmental Education: The study of the interrelationships between various components of natural and human systems in the total environment. These components involve considerations of energy, population, pollution, total resource allocation, resource depletion, conservation, transportation, technology, economics, urban and rural planning, and the study of specific environmental issues related to these areas. See also Holistic Environmental Education.

Curriculum Delivery System (CDS): A system which provides the organizational and procedural arrangements that facilitate the infusion of educational programs (procedures, practices, and resources) into a user system so that they can become an integral part of the system.

Design: A mode of inquiry, including analysis and problem solving, that is cyclical or iterative in nature, and that leads to the specification and the model of the product or system to be developed.

Holistic Environmental Education: Education that promotes an understanding and clarification of the complex interrelationships between human and natural systems in the environment by the examination of the components and reciprocal functions of both.

Model: An abstract representation of reality, or an organized expression of a mental image. This image can be described, depicted or otherwise displayed. Here, the term "model" is used in the sense of a mental image.

Model of a Curriculum Delivery System (CDS): A descriptive representation of a CDS. The model describes the components of the delivery system and the relationship among the components. The model presented in this and the accompanying documents is derived from a synthesis of several user-specific delivery systems, and is a basis upon which appropriate curriculum delivery systems can be developed and adapted to fit into a variety of educational settings.

User System: The targeted educational setting (county, district, school) that is the focus for educational planning and design, and involves the primary implementers and recipients of educational programs and products.

CHAPTER ONE

A PERSPECTIVE ON DESIGN

The design of a delivery system for an environmental education (EE) program requires both a systems perspective and a systems approach. A systems perspective enables one to understand the various aspects and components of an EE program and its relationship to (i.e., how it effects and is affected by) the larger school system and curriculum of which it is a part. A systems approach enables one to search for and find ways to deal with the various complexities of an EE program and its educational setting in order to ensure the program's compatibility with and (long-term) survival within that setting.

With these notions in mind, we will now consider two general approaches to designing an EE delivery system and examine the basic steps and sequence involved in such design.

A. Basic Approaches to Designing an EE Delivery System

Applying a systems approach to the design of an EE delivery system will involve considering a complex network of program variables and their interrelationships as one specifies desired program goals and curriculum objectives, considers alternative approaches to implementing the program, and selects specific implementation strategies and tactics that facilitate program effectiveness and quality. A design scheme that accomplishes these ends can be implemented in two ways. One way is to begin with an analysis of the existing state of affairs and work from it incrementally (step-by-step) toward an end result. The other way begins with an ideal system image, takes into account the expected outcomes and benefits of such a system, considers institutional (and other) barriers and constraints that inhibit the realization

of the ideal system, and, finally, considers strategies that facilitate the attainment of the ideal system.

The two approaches may produce very different solutions. Following the first approach usually leads the designer to start with school system constraints--staying basically within the boundaries of the system as it is perceived--while attempting to actualize only those aspects of the desired EE program that do not meet with resistance from nor conflict with current school system priorities and expectations. In contrast, the second approach usually leads the designer to formulate ways to get the school system to accommodate the desired program in an ideal or near ideal state. Those designers working within tightly-controlled school systems with rather inflexible priorities and programs may feel compelled to follow the first approach. On the other hand, those designers working within more open and flexible school systems or circumstances may have more latitude to adopt the second approach.

With respect to the second approach, the designer begins by evolving a model of an EE program that, for the moment, assumes ideal circumstances, i.e., where program development and implementation are designed without concern for real constraints. The creation of an unconstrained ideal program model offers the benefit of bringing together ideas about the existing educational system and the desired EE program in such a way that an optimal EE program model that best approximates the ideal state can be evolved, and later adjusted or adapted after considering real school system constraints (in the form of prevailing policies, priorities, resources, skills and attitudes). Thus, the ideal system approach begins with the formulation of goals and goal-relevant functions of the EE program to be created. As images

of the ideal EE program and its delivery requirements are developed, information concerning specific relationships between the program and the larger school system's priorities and resources are fed in to transform the ideal image into a workable and realistically attainable program and program delivery plan.

The remaining chapters of this guide will reflect an ideal systems approach to design since it offers a most effective way to present, comprehensively, the various processes and requirements for developing an EE delivery system.

B. The Process of Designing an EE Delivery System

The major operations involved in designing an EE delivery system are derived from two sources: the EE delivery concerns (described in the Generic Model document) and a sequence of well-established program design, development, and implementation steps.

As derived from the Generic Model, designing an EE delivery system involves:

- characterizing the educational system into which EE is to be delivered (this includes at least considering, if not specifying, how the targeted school system will benefit from the institutionalization of EE);
- specifying an ideal EE curriculum in terms of instructional and learning goals, objectives, and content;
- specifying program requirements (e.g., general support, materials, resources, skill development, etc.) necessary to actualize this ideal EE curriculum;
- identifying barriers or constraints that will act to inhibit the realization of the program requirements in a targeted educational setting;

- specifying delivery strategies and tactics (from possible alternatives) that will be utilized to develop and implement the EE curriculum and program and to overcome or circumvent barriers; and

- specifying evaluation procedures (criteria, methods, and instruments) for determining (1) the quality of the delivery system design and (2) the effectiveness of the delivery strategies and tactics.

Furthermore, these design "operations" can be arranged in a sequence of standard program development steps as follows:

- Purposing*--where EE program designers: (1) identify the needs in a district's or school's standard curriculum to which an EE program responds, and (2) establish the parameters within which environmental learning is to occur by developing a set of (ideal) learning goals and objectives that are consistent with some EE curriculum content model. This curriculum content model may be "invented" by the program staff, developed on the basis of the findings in a school or district-wide needs assessment, or adapted from an external source such as a federal, state, or local agency.

- Planning*--where EE program designers set program requirements under which the (ideal) learning goals and objectives will be achieved by:

  --specifying appropriate EE content to develop students' environmental knowledge, skills, and attitudes;

  --specifying appropriate instructional and learning resources to transmit the content to learners;

  --identifying needed program management procedures, arrangements, and resources that facilitate the development of EE content and instructional and learning resources;

  --identifying required approvals, support, and assistance from school board members, district administrators, principals, parents, etc.

  --specifying general criteria to evaluate student learning and program management outcomes.

---

*Both the purposing and planning steps satisfy the definition subsystem requirements for an EE (change) delivery system described in the Generic Model (Chapter Five).

- Programming**--where EE program developers work out conditions and specify ways to implement the curriculum, and to manage, evaluate, and improve the program by:

  --developing a program implementation and management plan;

  --identifying barriers and constraints;

  --selecting (from among alternatives) strategies and tactics to obtain key resources and support, develop staff skills, manage and develop the program, and overcome or circumvent barriers;

  --selecting evaluation methods and (types of) instruments according to the criteria selected under "Planning."

- Implementing***--where program staff and teachers carry out program plans by installing and utilizing agreed upon procedures and resources for soliciting support, developing instructional and learning materials, preparing and training teachers, disseminating program information, etc.

- Evaluating***--where program designers, staff, and teachers assess the EE program and its delivery in terms of each of the five levels of planning described in the Generic Model, i.e., school board/district support, program management, curriculum development, instruction, learning experience.

The relationship between the design "operations" and the design sequence just described is illustrated in Figure 1.

As the figure suggests, the process of designing and developing an EE delivery system is an on-going and cyclical or iterative one. At each stage of this process, various EE program development activities will be designed, tried out, evaluated, and revised or re-designed in order to promote further program development and provide for its institutionalization within a targeted educational setting.

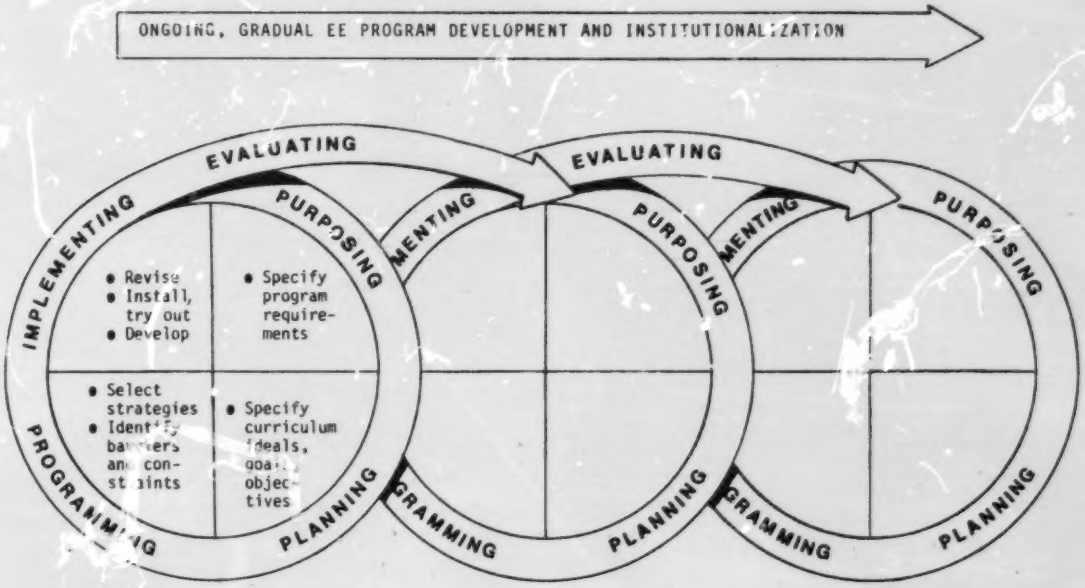
In the remaining chapters of this document, we will examine in greater detail the operations required to design and develop an EE delivery system.

** The programming step satisfies the design subsystem requirements for an EE (change) delivery system described in the Generic Model (Chapter Five).

*** The implementing and evaluating steps satisfy the implementation and management subsystem requirements for an EE (change) delivery system described in the Generic Model (Chapter Five).

Figure 1

Iterative Nature of Designing and Developing an EE Delivery System



CHAPTER TWO

SPECIFYING AN IDEAL ENVIRONMENTAL EDUCATION CURRICULUM

The design of an EE program and its delivery system is preceeded by a recognition, on the part of the educational practitioners, of the need for environmental education and by a desire to "improve" their educational system by reorganizing or expanding an existing curriculum to accommodate this EE need. From this general recognition of need and desire for change, practitioners can begin the first design task of characterizing the nature of the EE program they wish to introduce into their school system.

Specifying an "ideal" EE curriculum constitutes an effective first step in the design of an EE program and its delivery system since it: (1) expresses general goals and objectives for environmental awareness and understanding; and (2) sets general limits on the nature and scope of an EE program. Creating an ideal curriculum image, therefore, provides a solid basis for a later step--that of tailoring specific EE program delivery objectives, procedures, and activities to the conditions (e.g., level of commitment and support, available materials, people and time resources) found within a specific district or school.

An "ideal" image of environmental education, its basic mission, goals, and curriculum content are presented in Chapter One of the Generic Model. In this Procedural Guide, we will elaborate on this image by (1) reemphasizing the basic goals and (2) objectives of EE, and by (3) offering some general examples of curriculum options (topics, activities, etc.) through which the EE goals and objectives can be achieved. This elaboration is not offered to constrain EE program designers but merely to offer them a basis for reflection and consideration since it summarizes the viewpoints of many

practitioners* with regard to what an EE curriculum is or should be and how it can be presented.

A. Major Instructional Goals of Environmental Education

- To increase awareness and understanding of the fundamental interrelationships and interdependencies between natural and human systems.
- To foster awareness of and concern about economic, social, political, and ecological interdependence in urban and rural areas.
- To foster concern and a sense of responsibility for the environment.
- To provide every person with opportunities to acquire the knowledge, values, attitudes, commitments, and skills needed to protect and improve the environment.
- To increase skills in synthesizing information from a variety of disciplines and knowledge areas in order to develop a more integrated body of knowledge and concomitant world view.
- To increase the capability of understanding and making decisions about key issues affecting the individual, society, and the environment.
- To foster new patterns of behavior of individuals, groups, and society as a whole toward the environment.

B. Types of EE Learning Objectives Compatible with the Major Goals

- Awareness: To acquire an awareness of and sensitivity to the total environment and its associated problems.
- Attitudes: To acquire a set of values and feelings of concern for the environment, and the motivation for actively participating in environmental improvement and protection.
- Knowledge: To gain a variety of experience in and acquire a basic understanding of the environment and its associated problems.
- Skills: To acquire the skills for identifying and solving or anticipating and preventing environmental problems.
- Participation: To take advantage of opportunities to be actively involved in learning about the environment and in working toward the resolution of environmental problems.

---

*For example Warfield, J.N., Banathy, B.H., et al., Clark, E., and others cited in Chapter One of the Generic Model.

C. Environmental Education Curriculum Options

In the options profile for designing EE programs presented in Chapter Six of the Generic Model, we describe the "focus of EE learning activities" (Table Nine, column F of the profile) as centering on environmental issues, problems, topics, or concepts/principles. In this section, we will elaborate on these curriculum content foci by presenting examples of general topical areas, issues, and concepts for EE, as well as examples of general topical settings, processes, and learning activities that can organize and convey EE curriculum content to learners--thereby achieving EE instructional goals and learning objectives. These examples and options are presented in Table One.

Columns A, B, and C in Table One represent broad content areas around which EE program/curriculum designers can plan, select, or develop more specific environmental topics, issues, and concepts appropriate for students at various grade levels. Column D represents contexts for organizing, delimiting, or focusing the classroom investigation and study of environmental topics, issues, and concepts. Columns E and F represent general processes and activities that promote understanding of environmental subject matter and develop skills and attitudes appropriate for environmental awareness and participation.

The set of examples presented in the table provides ways to begin thinking about one's ideal EE curriculum. Beginning with this ideal curriculum is an important first step in designing an EE program and its delivery system because it provides an overall purpose and direction for performing the next design step--that of specifying EE program delivery requirements. We will consider some important types of program delivery requirements in the next chapter.

Table One

Examples of EE Curriculum Areas and Options for Organizing and Conveying EE Content to Learners

A General EE topics	B General EE issues/problems	C General EE concepts or themes	D Types of EE topic/ issue contexts	E Types of EE learning processes	F Types of EE learning activities
• population • pollution • resource allocation • resource depletion • conservation • transportation • technology • economic impact • urban and rural planning • environmental quality • ecological balance	• energy delivery and use • energy conservation and utilization of resources • use and management of land resources • energy intensive urban growth and the the quality of life • cumulative effects of pollution • regulatory constraints and economic growth • limits to the management of large complex systems (social, political, and economic) • growing need for "appropriate technology" • societal changes required to adapt to new energy sources • effects of technological "stress" on individuals and society • impacts of biological and medical advances on society • growing conflict between centralized control and individual freedom • chronic unemployment • the societal effects of mass media • inefficiencies in problem-solving caused by institutional boundaries or "territorialism" • loss of political and social cohesion • potential conflict between low growth and high expectations • the social response to energy disappointments	• general systems themes: --system --interactions --cycles --feedback --equilibrium --hierarchy --systemic energy flow --systemic evolution • ecological themes/concepts: --cycles --flow --diversity --carrying capacity --niche/community --habitat --patterns --change --adaptation/evolution --interdependence • principles of energetics: --law of conservation of energy --law of degradation of energy --maximum power principle	• environments: --natural --rural --suburban --urban • boundaries: --ecosystemic --geographical --political --social --individual or psychological • levels: --local --state --regional --national --international --global	• problem solving • decision-making • planning and policy making • urban design • worldview and values clarification • net energy and energy quality assessment • systems analysis • lifestyle assessment	• simulations • role playing • experimenting • data gathering • team debates • brainstorming • field trips • individual/group research projects, presentations, reports • lectures/demonstrations • practicums • internships or volunteer participation in community EE organizations, events, projects, activities • special school or classroom EE events (festivals, bazaars, open-houses, show and tells) • outdoor activities (outdoor ecological centers) • guest speakers

CHAPTER THREE

SPECIFYING PROGRAM REQUIREMENTS

Program requirements specify the capabilities, structures, functions, and resources that are necessary to acquire institutional support for an environmental education program, to develop its curriculum, and to implement its program management, instruction, and evaluation components. The term "program requirements," therefore, will be defined broadly to include all those aspects that address the delivery (i.e., planning, development, and implementation) of environmental education in a specific educational setting. In this chapter we will (1) characterize some major types of program requirements that address a variety of school situations and (2) describe two ways that program requirements can be organized and specified.

A. Types of Program Requirements

There are some general types of EE program delivery requirements that are frequently encountered by local EE program design staff.* The types of required capabilities, conditions, and resources described here are offered to provide EE designers and developers with a basis for anticipating and thinking about their local EE "delivery" needs. These typical EE delivery requirements are the following:

1. ADEQUATE BASES FOR DESIGNING/PLANNING THE EE PROGRAM AND ITS DELIVERY--e.g., based on needs assessment, implementation feasibility assessment, short- and long-term impacts assessment.

2. SHARED UNDERSTANDING AND CONSENSUS OVER EE PROGRAM GOALS AND PROGRAM DELIVERY REQUIREMENTS--between school board, district and building administrators, program staff, and parents.

---

*These types of EE delivery program requirements are drawn from relevant literature (see the bibliography in the Generic Model) and from conversations with a number of EE program directors and coordinators known to the authors.

3. ADEQUATE AND APPROPRIATE EE CURRICULUM DESIGN--e.g., curriculum is based on a holistic model of EE content; is specified for different grade levels and subject matters; has adaptable EE activities/materials; has a set of required or non-discretionary core concepts, topics, and skills; has continuity of learning objectives and activities progressing from simple nature appreciation and awareness to understanding of complex environmental systems and utilization of problem-solving and decision-making strategies regarding environmental issues.

4. ADEQUATE PROGRAM SUPPORT--i.e., sanctions, approvals, cooperation or participation from school board members, district administrators, school principal(s), program or department heads, teachers, university/college faculty, parents, community organizations, state agencies.

5. ADEQUATE FUNDING--e.g., from district, state, federal, and/or private (foundations, businesses, societies, clubs) sources.

6. ADEQUATE PROGRAM MANAGEMENT RESOURCES--e.g., staff and staff time, space or facilities, access to information and people.

7. ADEQUATE INSTRUCTIONAL AND LEARNING RESOURCES--e.g., EE data and information, materials, field experience and observation sites, knowledgeable people/experts.

8. ADEQUATE EVALUATION AND REVISION PROCEDURES--for obtaining timely feedback on the effectiveness of the EE delivery process, for assessing student learning and achievement outcomes, and for making appropriate adjustments, corrections, and revisions in curriculum or instructional learning arrangements.

9. ADEQUATE EVALUATION MEASURES/INSTRUMENTS--in all areas of EE delivery: project management, curriculum development, instruction, learning.

10. MANAGEABLE EE PROGRAM SCOPE--with respect to available time, resources, staff experience and capabilities.

11. ADEQUATE PLAN TO FACILITATE EE PROGRAM CONTINUATION AND LONGEVITY--e.g., for obtaining continued support and participation of teachers, administrators, parents, school board; for on-going staff development, teacher training, materials development; for moving from special funding status to permanent program status; for carrying out ongoing needs-assessment, representative planning, review and recommendation procedures.

12. ADEQUATE AND TIMELY SCHEDULING--of EE curriculum development and implementation, program management, and evaluation activities.

Using this general list as a guide, EE program designers can devise a more specific set of program requirements that will deliver their ideal (or near ideal) EE curriculum in a specific educational setting.

B. Ways to Organize and Specify Program Requirements

It is usually helpful for designers to organize their thinking about an EE program and its delivery requirements in a way that ensures adequate foresight and thoroughness. Two organizing frameworks that may facilitate these ends are presented in Chapter Six of the Generic Model. The two frameworks consist of (1) a design structure for institutionalizing environmental education and (2) levels of planning considerations (for designing an EE delivery and support system).

The first organizing framework--a design structure for institutionalizing EE*--shows that EE program delivery requirements can be specified in terms of seven operational areas:

- Planning--where one considers requirements for designing the program and its delivery system, e.g., developing adequate justification for the EE program (or activities, materials), obtaining participation in and institutional support for the planning effort, developing consensus over program goals.
- Learning systems design--where one considers requirements for developing an EE curriculum that addresses agreed upon EE goals and achieves EE learning objectives.
- Personnel development--where one considers requirements for the preparation and training of teachers and EE facilitators.
- Learning activities--where one considers requirements for implementing the EE curriculum in terms of specific learning arrangements, activities, and materials.
- Learning outcomes--where one considers requirements for assessing students' attainment of desired environmental knowledge, skills, and attitudes.
- Delivery systems and support--where one considers requirements for implementing and institutionalizing EE by developing institutional support and funding for program development; establishing cooperative

*See Warfield, J.N., cited in Chapter Six of the Generic Model.

arrangements between district administrators, school principals, teachers, parents, and outside agencies; providing for dissemination of newly developed materials and activities; disseminating information on program accomplishments.

- Evaluation--where one considers requirements for evaluating the success of EE program development and delivery efforts (in addition to student learning outcomes).

The second (and alternative) organizing framework--levels of planning considerations--shows that EE program delivery requirements can be specified in terms of the following five areas:*

- School board/district support--where one considers requirements for obtaining approvals and support from key decision makers and decision-making bodies, for obtaining funding, and for obtaining essential support services.

- Program management--where one considers requirements for identifying and involving key personnel in planning program activities, and in developing procedures and resources for program development, implementation, evaluation and improvement.

- Curriculum development-- where one considers requirements for developing EE curriculum content and for preparing teachers to implement the content.

- Instruction--where one considers requirements for specific resources, activities, and materials necessary to transmit curriculum content to learners.

- Learning experience--where one considers requirements for evaluating students' acquisition of desired environmental knowledge, attitudes, and skills.

Either or both of these frameworks can be used by designers to identify specific conditions, capabilities, and resources needed to develop and implement an EE program in a specified educational setting. Using one of these--the levels of planning framework--we have organized in Table Two the typical program requirements, barriers and constraints, and delivery strategies and tactics that have been described in this chapter and that will be described in Chapters Four and Five. This was done to demonstrate the utility of the

*These are described in more detail in Section C, Chapter Six of the Generic Model.

Table Two

Specifications for an EE Delivery System Using the Levels of Planning Framework

	A Types of program requirements*	B Types of barriers and constraints**	C Types of strategies***
School board/district support	4, 5	1, 5, 8, 9, 10	2, 3, 15, 16
Program management	1, 2, 6, 10, 11, 12	1, 2, 5, 6, 11	1, 2, 4, 7, 8, 9, 10, 11, 12, 14, 15, 16
Curriculum development	3	3, 7, 9, 11	1, 4, 6, 11, 14
Instruction	7	1, 3, 4, 5, 7, 9, 11	2, 4, 5, 8, 11, 13, 14
Learning experience	8, 9	4	13, 14

* The numbers in the cells of column A correspond to the program requirements listed in this chapter (Chapter Three).

** The numbers in the cells of column B correspond to the barriers and constraints listed in Chapter Four.

*** The numbers in the cells of column C correspond to the strategies and tactics listed in Chapter Five.

organizing framework as a vehicle for displaying EE delivery design specifications and for checking the inclusiveness of one's design.

After requirements for developing and implementing an (ideal or near ideal) EE program are identified, the practicality of the requirements can then be examined by considering the actual conditions--including barriers and constraints--engendered by a specific educational setting. Some frequently encountered barriers and constraints will be presented in the next chapter.

CHAPTER FOUR

IDENTIFYING BARRIERS AND CONSTRAINTS

Once an ideal EE curriculum and set of program delivery requirements have been specified (at least tentatively), designers can begin identifying existing barriers and constraints to delivering the desired EE program in a specific educational setting. These barriers and constraints constitute conditions, capabilities, resources, or personnel characteristics that act to inhibit, impede, or obstruct the actualization of program requirements and, thus, the delivery of the desired EE program.

The distinction between barriers and constraints tends to be a relative one. Barriers are seen as conditions that can be circumvented or overcome through the application of effective strategies and tactics--for example, conditions involving administrative support, available instructional materials, or teacher skills may be considered surmountable by EE program designers. Constraints, on the other hand, are seen as conditions that are "givens" and, therefore, relatively unchangeable or insurmountable--for example, those involving district policies, school organizational structures, available financial resources, administrator or teacher interests and attitudes.

Regardless of the distinction between barriers and constraints,* an adequate design for an EE program and its delivery system requires anticipating, to the extent possible, the major barriers and constraints existing in a specified educational setting so that appropriate program modifications and suitable implementation strategies can be devised.

---

*This distinction will be examined further in Chapter Five.

The general types of barriers and constraints listed below are those most frequently encountered by EE facilitators and school personnel in their efforts to deliver EE curricula and programs. As in Chapter Three, the general types presented here tend to characterize and encompass a variety of more specific school setting "obstacles" that need to be addressed by local EE program designers. As before, the list is intended to serve as a basis from which designers can anticipate and identify delivery obstacles relevant to their local school situations. Typical barriers and constraints, therefore, are the following:

A. Barriers

1. CONFLICT OR DISAGREEMENT--over EE program goals, delivery requirements or curriculum implementation approaches between program staff and school board, district administration, school principals, teachers, or parents.

2. INADEQUATE PROGRAM MANAGEMENT PLAN--unrealistic assessments of time and effort required to carry out EE program delivery tasks, e.g., execute strategies, obtain support/commitments, etc.; poor scheduling of various program tasks and activities, e.g., work overloads with excessive demands on time, skills; lack of adequate planning time allocations; overly comprehensive or ambitious start-up goals, e.g., to infuse EE simultaneously into grades K-12 or in many or most schools throughout the district.

3. LACK OF NEEDED STAFF OR TEACHER KNOWLEDGE OR SKILLS--in developing EE curriculum; in infusing EE curriculum into various grade levels and subject matters.

4. LACK OF FIDELITY OF TEACHING PRACTICES AND ACTIVITIES TO EE CURRICULUM GOALS OR TO IMPLEMENTATION PLAN--excessive departures from or modification of agreed upon curriculum content, instructional practices, student learning activities.

5. INEFFECTIVE COMMUNICATIONS--isolation of program from other school programs; lack of clarity about curriculum goals and learning objectives on the part of teachers; lack of clarity about EE program goals, purposes, activities on the part of school board, district administrators, principals, or parents.

6. INEXPERIENCED OR INEFFECTIVE PROGRAM MANAGEMENT--excessive problems in program planning, organizing, scheduling, coordinating, evaluating, resolving conflicts, communicating, etc. (see also #2--Inadequate Program Management Plan).

7. FEW OR INADEQUATE INSTRUCTIONAL/LEARNING RESOURCES--lack of appropriate texts, A-V materials, simulation games, construction materials, etc.

B. Constraints

8. LACK OF INTEREST IN OR COMMITMENT TO ENVIRONMENTAL EDUCATION--on the part of school board, district administrators, principals, teachers. (This does not mean opposition or active resistance to EE, but refers to a general apathy or indifference, e.g., inability to see need for or advantages of EE).

9. ORGANIZATIONAL RIGIDITY--inflexible subject-matter priorities that conflict with EE goals, e.g., our emphasis on "back to basics"; over-compartmentalization of curriculum that prevents interdisciplinary instructional approaches or introduction of new EE subject matter/activities; inflexible bureaucratic procedures or regulations that interfere with the acquisition of needed resources for program development, instruction, or learning.

10. LACK OF INSTITUTIONAL INCENTIVES FOR CHANGE--pervasive low expectations of students', teachers', or administrators' capabilities (especially to handle new EE activities) due to past failures, or financial or status insecurity (see also #8--Lack of Interest in or Commitment to EE).

11. LACK OF EXTERNAL AGENT/AGENCY ASSISTANCE--lack of adequate information, models, guidelines, materials from state departments, local universities/colleges, community organizations, or other local school districts.

Identifying barriers and constraints to the delivery of an EE program will aid designers in re-examining their idealized curriculum and program delivery requirements in order to bring them in line with actual conditions in an educational setting. To do this, EE program designers may need to engage in a form of "tradeoff analysis" wherein the desirability of various curriculum specifications and program requirements are weighed against the likelihood of their being achieved under prevailing school system conditions.

A discussion of "tradeoff" considerations as well as a discussion of general strategies and tactics found to be effective in delivering EE programs will be presented in the next chapter.

CHAPTER FIVE

SELECTING DELIVERY STRATEGIES AND TACTICS

There are two assumptions that underlie the selection of delivery strategies and tactics. First, a strategy or tactic* must facilitate a particular policy or approach to implementing an educational change; and, second, it must indicate, either explicitly or implicitly, choices about specific activities, arrangements, or procedures that promote the institutionalization (i.e., development, implementation, and continuation) of an educational change.

From these assumptions, we can define environmental education delivery strategies and tactics as a set of reality-oriented "plans" of action for promoting the institutionalization of an EE program. This set of "plans" is geared to achieving curriculum ideals and program requirements by adapting to or circumventing barriers to EE program institutionalization through the use of various procedures, arrangements, or activities. Often, an effective strategy or tactic may serve several purposes. For example, a tactic that facilitates the achievement of a particular program requirement may also serve to prevent a potential barrier from becoming a problem and, thus, adversely affecting the delivery of the EE program. Or, a single strategy may facilitate the achievement of several program requirements or the circumnavigation of several obstacles.

With these notions in mind, in this chapter, we will first examine some general types of strategies and tactics that could be useful to EE program developers, and then consider the process of selecting specific strategies and tactics.

---

*The distinction between delivery strategies and delivery tactics is that strategies are more broadly defined (than tactics) while tactics break down strategies into more specific arrangements.

A. General Types of Strategies and Tactics

One of the first major strategy decisions that must be made by designers involves the curriculum delivery approach that will be utilized. EE curriculum delivery usually involves one of four possible strategies. These are characterized in the Generic Model (Chapter Six, Table Nine, column C) and are repeated here:

- Add onto the standard curriculum as a new EE course or a program.
- Add onto existing subject matters as separate "mini-modules" or units.
- Infuse and integrate into existing subject matters as compatible or related topics, concepts, and activities.
- Reorganize the standard curriculum to accommodate the holistic/interdisciplinary perspective, and issues/decision-making orientation of EE.

Once the decision is made as to which one or a combination of the above will be employed--depending on existing school system conditions--the selection of tactics for EE program delivery can proceed.

Following is a list of some general types of tactics that have been found to be most helpful by EE program developers in delivering environmental education in various educational settings.*

1. TEACHER PARTICIPATION IN PROGRAM OR PROJECT PLANNING AND DECISION-MAKING--to ensure relevance of curriculum or program to needs and interests of teachers and their students; to develop a sense of ownership and commitment to project/program goals.

2. PRINCIPAL PARTICIPATION IN PROGRAM OR PROJECT PLANNING AND TEACHER TRAINING--to develop principal's understanding of the project/program and promote his/her support; to demonstrate principal's support to teacher; to help staff develop teachers' skills in implementing and sustaining project/program activities.

*These types of tactics are most often cited in the literature on educational change and innovation and are most often recommended by practitioners actively engaged in the development and delivery of environmental education programs (for example literature sources, see Chapter Four and the Bibliography in the Generic Model).

3. PARTICIPATION OF OTHER KEY STAKEHOLDERS IN PROGRAM OR PROJECT PLANNING AND GOAL SETTING--to promote and ensure the support, commitment, and/or participation of parents, school board members, community groups and organizations, university staff, etc.; to provide for a program that satisfies a wide range of interests and needs; to provide for a variety of technical assistance and material resources.

4. OBSERVATION OF (SIMILAR) EE PROGRAMS OR ACTIVITIES IN OTHER SCHOOLS OR DISTRICTS--to help staff anticipate problems of curriculum development and implementation, teacher preparation and training, obtaining support and funding, and ways to remedy these problems.

5. OBSERVATION OF EE ACTIVITIES IN THE CLASSROOM--to provide a model of effective EE activities and their implementation to "uninitiated" or "resistant" teachers; to demonstrate to teachers that "they can do it, too."

6. "LOCAL" MATERIALS DEVELOPMENT BY PROGRAM STAFF AND TEACHERS--to promote a sense of ownership regarding the curriculum, curriculum materials, and activities; to provide an opportunity to learn-by-doing; to develop a sense of clarity and commitment regarding program/project goals and objectives.

7. GRADUAL, NON-COMPREHENSIVE EE PROGRAM STARTUP--to avoid attempting too much too soon, e.g., first or second year K-12 or multi-school implementation; to allow for adequate discrimination between the needs and requirements of elementary, intermediate, and secondary teachers; to avoid spreading initial resources too thin; to allow for gradual development of a "critical mass" of participants without compromising the quality of the curriculum implementation effort.

8. PRIMARY RELIANCE ON INTEREST (RATHER THAN PAY) INCENTIVES--to ensure motivation and commitment of teachers to carry out EE program activities, to change or adjust their classroom practices as needed, and to continue to improve and refine such efforts in the future.

9. PRIMARY RELIANCE ON INTERNAL (DISTRICT, SCHOOL) PERSONNEL FOR TECHNICAL ASSISTANCE--to minimize overly general or irrelevant assistance often provided by outside consultants; to ensure needed technical assistance on an immediate, "on call" basis.

10. PRIMARY RELIANCE ON "LOCAL" PLANNING/MANAGEMENT APPROACHES--to avoid inflexibility of pre-packaged management approaches; to increase specificity (and, therefore, adaptiveness) of program plans and practices to local school settings and conditions; to promote a greater sense of ownership and commitment to program goals and objectives.

11. CONCRETE (PRACTICAL), TEACHER-SPECIFIC, AND ON-GOING TRAINING--to develop teachers' skills in developing curriculum materials and activities and implementing them in their classrooms; to accommodate teacher preparation and assistance needs that change over time.

12. REGULAR PROGRAM MEETINGS--to provide a forum for sharing problems, successes, and suggestions, and to provide a vehicle for building staff/teacher morale and cohesiveness.

13. IN-CLASSROOM ASSISTANCE FROM PROGRAM (OR DISTRICT) STAFF--to provide teachers with technical assistance and encouragement; to promote effective use or adaptation of EE materials, activities, and practices in the classroom; to promote a sense of support and cooperation.

14. ON-GOING MONITORING AND EVALUATION OF CLASSROOM ACTIVITIES--to provide teachers and staff with timely and appropriate information to improve the adequacy and quality of EE curriculum materials, instructional procedures, and student learning activities.

15. ON-GOING MONITORING AND EVALUATION OF PROGRAM ACTIVITIES--to provide staff, principals, or district administrators with timely and appropriate information on student outcomes, teacher practices, and staff experiences as a basis for making EE program revisions or continuation decisions; to provide information for improving EE curriculum, program management, teacher training, and communications between staff, teachers, district personnel, parents.

16. FREQUENT OR REGULAR DISSEMINATION OF INFORMATION ABOUT THE EE PROGRAM OR CLASSROOM ACTIVITIES--to promote understanding of and support for the EE project or program; to demonstrate or advertise successes; to inform and assist others engaged in similar projects; to communicate or disseminate information regarding EE project or program goals, plans, activities, progress, products, or accomplishments to parents, other teachers, district or school administrators, board of education members, other school districts, outside agencies, local community.

These general types of tactics can be used by EE program designers as a basis for developing more specific procedures, arrangements, and activities that promote the delivery of environmental education in their local district or school.

B. Considerations in Selecting Strategies and Tactics

Appropriate strategies and tactics are selected as EE planners examine specific EE program delivery requirements and weigh them against the constraints and barriers presented within an educational setting.

Since constraints represent relatively inflexible conditions in the educational environment, the critical consideration faced by EE program designers is the extent to which the ideal EE curriculum (and the requirements for its delivery) can be modified to accommodate reality without undermining the basic integrity of the desired curriculum. In other words, the "trick" here is to be able to modify or refine the program delivery requirements sufficiently to accommodate real constraints but not to the extent of loss of "fidelity" to basic EE curriculum goals and objectives. The process of modifying or refining an idealized EE curriculum and its program delivery requirements involves a type of tradeoff analysis which, in itself, is a program management strategy. (We will return to this topic shortly.)

On the other hand, with respect to delivery barriers that represent conditions that are considered to be changeable or surmountable, EE program designers can select delivery strategies that help to realize EE program requirements either directly (through implementation strategies) or indirectly (through barrier removal strategies). In either case, for each program delivery requirement, the critical considerations are the nature and extent of the tasks needed to achieve it in a specific district or school. To illustrate, if the task is perceived as involving the mobilization of favorable conditions (e.g., readily available resources), then an implementation strategy can be selected; if the task is perceived as involving unfavorable conditions (e.g., lack of district support), then a barrier removal strategy can be selected. This distinction, however, may not always be important since an effective implementation strategy or tactic will often act to overcome barriers.

In considering EE delivery strategies and tactics, it may be helpful to examine a decision tree that organizes and displays the general processes

involved in strategy analysis and selection. Since it is not our purpose to prescribe a particular selection procedure, this decision tree should be understood as merely suggestive of the decision-making processes required in strategy selection and evaluation. These processes are displayed in Figure 2.

As shown by the decision tree, in selecting strategies and tactics for the delivery of EE, one can begin with one's notion of an ideal EE curriculum, and then develop a set of (ideal) program requirements or specifications that will deliver this curriculum in a specific educational (county, district, school) setting. Next, one examines the program requirements in the light of real constraints and barriers presented by the educational setting. As one considers constraints, the design task will always involve modifying the affected EE delivery program requirements to bring them into line with the constraining conditions. As one considers barriers, the design task will involve: (1) assessing the importance of the affected program requirements with regard to their necessity in actualizing the desired (ideal) EE curriculum, (2) assessing the achievability of the program requirements with regard to the availability of resources (i.e., money, time, people, materials, knowledge, skills, motivation), (3) modifying the program requirements depending on their importance and achievability, and (4) devising specific procedures, arrangements, or activities whereby modified or unmodified program requirements can be achieved.

Weighing the importance versus the achievability of one's EE program delivery requirements involves an analysis of tradeoffs between certain benefits and risks in trying to achieve the desired (ideal) EE curriculum under actual conditions presented in a district or school. A characterization of this tradeoff analysis is presented in Table Three.

Figure 2

A Decision Tree for the Selection and Evaluation of Strategies and Tactics to Deliver EE

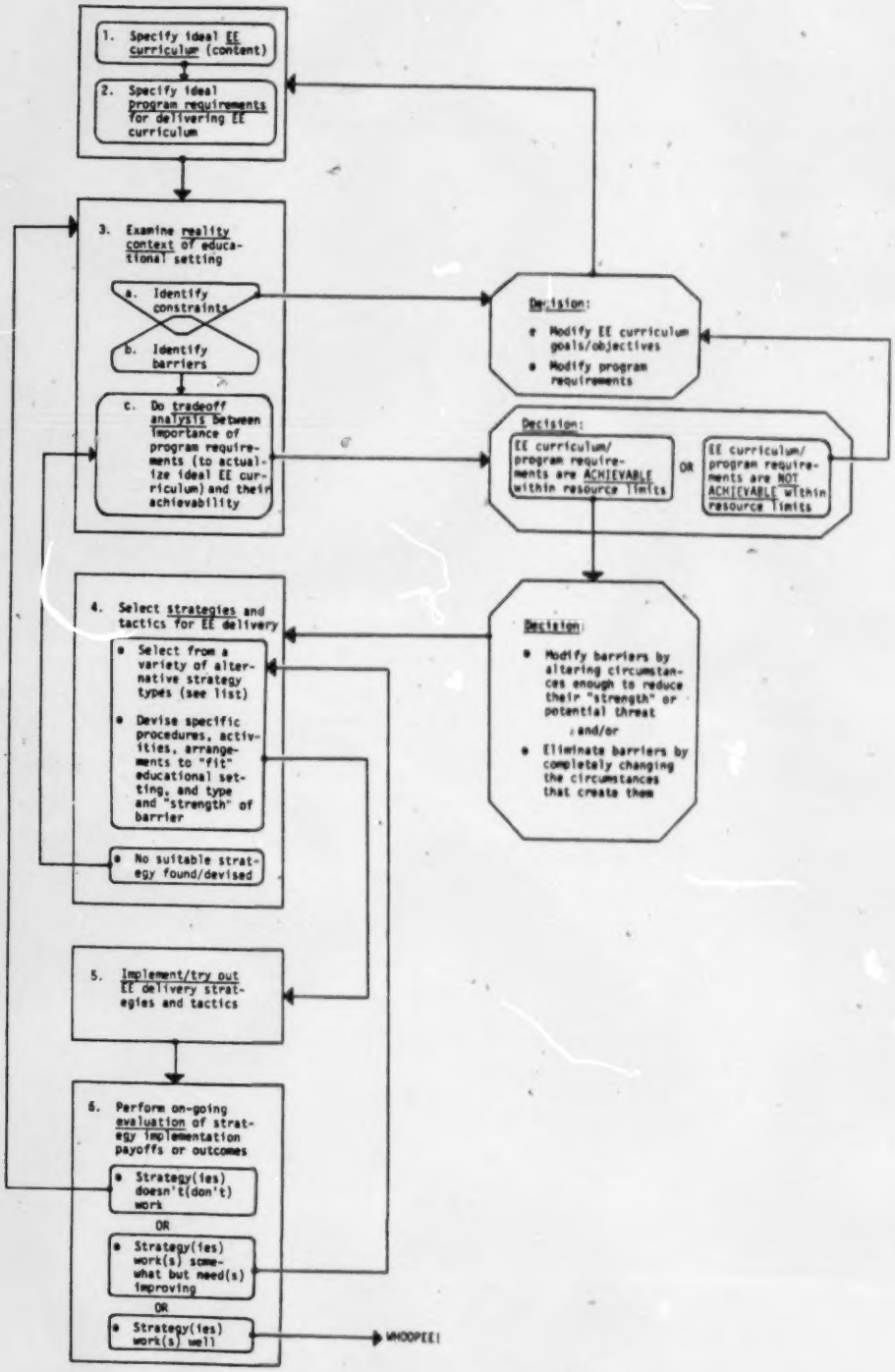

1. Specify ideal EE curriculum (content)
2. Specify ideal program requirements for delivering EE curriculum
3. Examine reality context of educational setting
a. Identify constraints
b. Identify barriers
c. Do tradeoff analysis between importance of program requirements (to actualize ideal EE curriculum) and their achievability
Decision:
• Modify EE curriculum goals/objectives
• Modify program requirements
Decision:
EE curriculum/program requirements are ACHIEVABLE within resource limits
OR
EE curriculum/program requirements are NOT ACHIEVABLE within resource limits
4. Select strategies and tactics for EE delivery
• Select from a variety of alternative strategy types (see list)
• Devise specific procedures, activities, arrangements to "fit" educational setting, and type and "strength" of barrier
• No suitable strategy found/devised
Decision:
• Modify barriers by altering circumstances enough to reduce their "strength" or potential threat
and/or
• Eliminate barriers by completely changing the circumstances that create them
5. Implement/try out EE delivery strategies and tactics
6. Perform on-going evaluation of strategy implementation payoffs or outcomes
• Strategy(ies) doesn't(don't) work
OR
• Strategy(ies) work(s) somewhat but need(s) improving
OR
• Strategy(ies) work(s) well
WHOOPEE!

Table Three

Tradeoff Analysis Between Importance Versus Achievability of Program Delivery Requirements

For a specified EE program delivery requirement--

If its IMPORTANCE is considered to be:	and its ACHIEVABILITY is considered to be:	your decision may be to:
HIGH	HIGH-MODERATE	• Retain program requirement as originally specified and assign as a highest priority. Benefit--increased fidelity to desired (ideal) EE curriculum.
HIGH	MODERATE-LOW	• Retain program requirement as originally specified and assign as a secondary priority. Benefit--same as above. Risk--suitable delivery strategy or tactic more difficult to devise or to implement successfully due to less readily available resources (i.e., money, time, people, materials, knowledge, skills, motivation). or • Modify program requirement as determined by available resources. Benefit--better adaptation to actual school conditions. Risk--the greater the threat of compromising the desired (ideal) EE curriculum.
LOW	HIGH-MODERATE	• Retain program requirement as originally specified and assign as a tertiary priority. Risk--may utilize resources needed to achieve program requirements of higher importance. or • Modify program requirement as determined by available resources.
LOW	MODERATE-LOW	• Modify program requirement as determined by available resources and assign as a lowest priority. or • Eliminate program requirement as non-essential.

The distinction between constraints and barriers is not a hard and fast one but can change over time as conditions within the educational setting change. Furthermore, defining a delivery "obstacle" as a barrier or a constraint will depend on the degree of resistance it offers to the actualization of program requirements as well as on the availability of resources (and amount of effort) required to overcome or circumvent it. Thus, the more resistance offered and the less resources available, the more a barrier assumes the proportions of a constraint.

Finally, as strategies and tactics for overcoming barriers are devised and implemented, their impacts can be evaluated in terms of whether or not or how well they worked. This evaluation will, in turn, determine subsequent courses of action--for example: (1) modifying the (ideal) EE curriculum and program requirements still further (if initial strategies or tactics fail); (2) selecting new, more effective strategies and tactics, or modifying the old ones (if they are only partially successful; or (3) "celebrating" (if the strategies/tactics are successful). It goes without saying that in real-life situations, employing a combination of delivery strategies and tactics will often be employed both to deal with co-existing EE delivery barriers and to achieve co-existing EE delivery requirements.

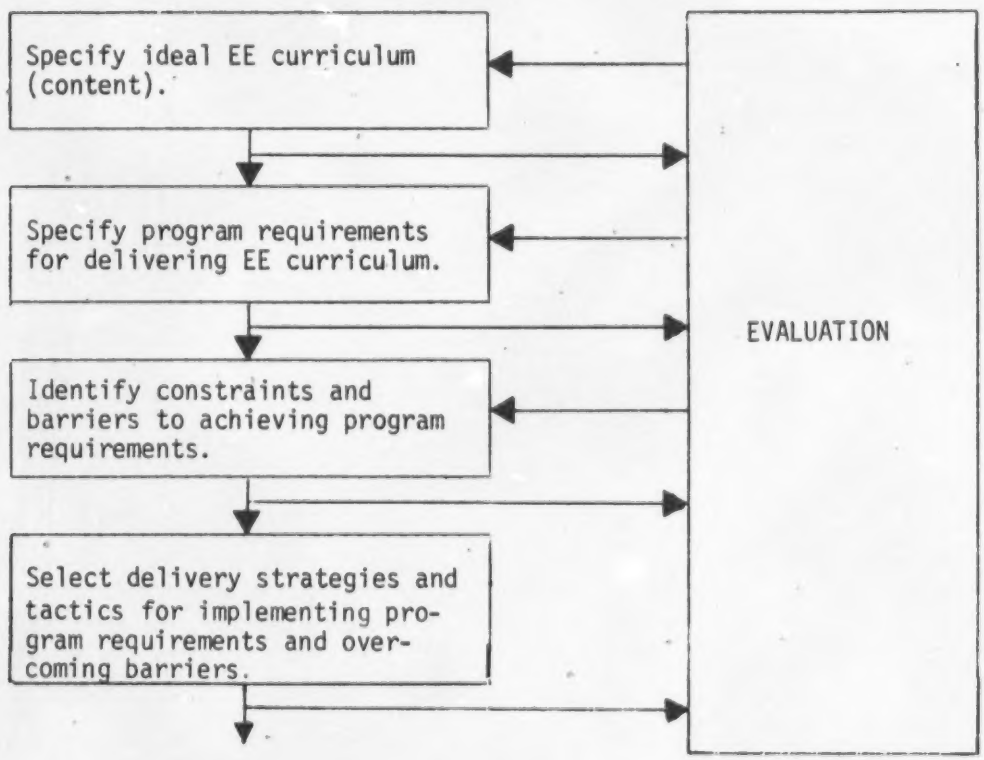
CHAPTER SIX

EVALUATING AN EE DELIVERY SYSTEM DESIGN

As illustrated in Figure 3 below, evaluation is an on-going, interactive activity that occurs at each step of the EE delivery design process, i.e., specifying an ideal EE curriculum, specifying program delivery requirements that achieve the ideal curriculum, identifying constraints and barriers to achieving these requirements, and selecting delivery strategies and tactics to implement program requirements and to overcome barriers.

Figure 3

Iterative Nature of Evaluating an EE Delivery System Design


Specify ideal EE curriculum (content).
Specify program requirements for delivering EE curriculum.
Identify constraints and barriers to achieving program requirements.
Select delivery strategies and tactics for implementing program requirements and overcoming barriers.
EVALUATION

The evaluation of an EE delivery system occurs in two phases: (1) in the conceptualization phase where the adequacy and quality of the delivery system design is assessed, and (2) in the application phase where the outcomes or consequences of having implemented various aspects of the delivery system --through various delivery strategies and tactics--are determined. Although this document is a Procedural Guide for designing an EE delivery system, our emphasis in this chapter will represent an integration of the concerns of the two phases of evaluation--design and application.

A. Some Preliminary Evaluation Considerations

Evaluation involves a complex series of processes for obtaining information or feedback to guide action. It is a mirror image of designing in the sense that it is the process of reviewing what has occurred against expectations (criteria) that are developed in the design process. To design without making explicit these many kinds of expectations and criteria by which a program is to be evaluated leaves the designer with the problem of evaluating ex post facto without adequate information.

The idea that evaluation should be "built-in" is an appropriate one in that EE program design should specify procedures and arrangements for the concurrent and continual collection and review of information to guide the program's activities, as well as to review periodically the program's effects. What these special kinds of guidance information consist of, how often they are obtained, and when and how they are used are the evaluative problems of design and planning.

To provide for an effective EE program and delivery system evaluation, every aspect of what is being done in the design process should be continuously assessed.

> Probably the most important aspect of evaluation is maintaining awareness of the assumptions made in each aspect of planning, for these are the criteria that must be used for making evaluative judgments. In planning, many assumptions are made: assumptions about cause and effect of relationships (what causes the problem and what can be done about it); assumptions about the environment (what can be influenced and what cannot); what support and resources can be expected; what else is going on that may affect the outcome; and particularly, what value has been assumed for the outcomes to be achieved in comparison with alternative uses of resources. These assumptions are based on the knowledge from the past and are the baselines against which judgments are made about current action.*

To "build in" evaluation to any design effort, all of the questions presented in the next two sections should be considered and specific and explicit answers regarding each should be provided.

B. General Questions for Assessing the Adequacy of each Step of the EE Delivery System Design Process

Since it is an on-going, iterative process, the evaluation of an EE delivery system occurs during both the design stage and the implementation stage. In order to be adequate and useful, the evaluation must address various aspects of the EE program (described above) as they apply to the major "delivery concerns" presented in previous chapters. Again, these major delivery concerns are as follows:

- the ideal EE curriculum content (including overall learning goals and objectives, concepts, topics/issues, activities) that is desired;
- the program requirements deemed necessary for curriculum development, instruction, program management, district support;
- the constraints and barriers perceived to exist in the educational system to prevent or inhibit the actualization of the program requirements; and

---

* Arnold, M.F. "Evaluation: A Feedback Model," in Blum, H.F., et al., Health Planning, 1969: Notes on Comprehensive Planning for Health. Berkeley, Calif: Comprehensive Health Planning Unit, School of Health, University of California, 1969, p. 13.07.

- the strategies and tactics selected to overcome or circumvent barriers to: (1) developing EE curriculum content, (2) developing instructional capabilities, (3) developing instruction and learning resources, (4) developing program management capabilities, (5) developing support and assistance for the EE program.

Relevant to each of these delivery concerns, and as a first step in developing a delivery system evaluation component, one can consider a set of general questions for assessing the overall adequacy of the delivery design. These questions are as follows:

(Ideal) EE curriculum content specifications

Have the key features of your EE curriculum content been specified in terms of:

--major environmental topics?

--major environmental issues and problems?

--key environmental concepts, principles, themes?

Is the curriculum content holistic? That is, does the content selected emphasize or focus on the interactions and interrelationships between natural and human systems?*

Is the curriculum content interdisciplinary? That is, does it make use of or draw upon the ideas, information, data, and points of view offered by a variety of subject areas and fields of knowledge?**

Have the overall student learning goals been specified in terms of general environmental knowledge, skills, and attitudes (or awarenesses) to be acquired?

---

*Keep in mind that EE is distinguished from strictly physical, natural, or social science concerns in that it examines and explores the interrelationships between natural and human systems rather than focusing exclusively on either. Thus, for example, studying food chains or animal life cycles is more appropriate to Biology or Zoology; whereas studying human impacts on natural food chains of animal life cycles is more appropriate to EE.

**Keep in mind that it is difficult to understand "holistic" environmental issues or problems without examining different perspectives in a variety of "disciplines."

Have various learning activities that can be used to convey the EE curriculum content been selected, e.g., tours, field trips, written assignments, lectures, interviews, experiments, special projects, simulations, discussions, etc.?

Have clear learning objectives geared to these activities been specified?

Have any special EE knowledge or skill prerequisites for students to study the EE curriculum content and carry out the learning activities been determined?

Have instructional sequences or schedules of learning activities been developed?

Have the methods and measures that will be used to evaluate students' achievement of the learning objectives been determined, e.g., discussion questions, written or oral reports, special task or project assignments, paper and pencil tests, classroom observations, questionnaires, etc.?

Have the information resources needed by students to carry out the learning activities been specified, e.g., readings (including books, news articles, reports, magazines), films, knowledgeable persons, natural or human-built observation sites, etc.?

Is the EE curriculum content specified compatible with the general specifications of an ideal EE curriculum presented in Chapter Two?

Program requirement specifications

Have the types of support needed to mobilize and sustain EE program development and delivery been identified, e.g., district/principal approvals, agreement for sharing and using resources, additional funds, participants for initial planning and implementation, etc.?

Has the preparation or training needed by teachers to implement the desired EE curriculum in the classroom been identified? Have required training materials and other teacher training resources been specified? Are there sufficient teacher training resources available (time, money, materials)?

Have resources needed by teachers to develop curriculum content and carry out instructional/learning activities been specified, e.g., reference and teaching materials, technical assistance, etc.? Are there sufficient instructional/learning resources available?

Have types of data/information, methods, and measures that will be used by program staff to evaluate EE program activities--especially teachers/classroom activities--been specified?

Has attention been given to important program management considerations, including: (1) ensuring representative planning and decision-making, (2) resolving conflicts, (3) maintaining channels of communication, (4) adjusting, amending, or changing the EE curriculum, (5) disseminating information and materials?

Does the delivery design take into account the general types of program requirements presented in Chapter Three?

Barrier/constraint identifications

Have the difficulties, problems, resistances, or obstacles--from within the school district and from external sources--in developing and implementing the EE program been anticipated?

Have the sources of these difficulties, problems, etc. been identified at various levels of planning (i.e., school board/district administration, program management, curriculum development, instruction, learner experience) and stages of institutionalization (i.e., mobilization, implementation, continuation)?

Are the anticipated difficulties, obstacles, etc. based on the first-hand experiences of the design group or of others who have implemented EE or educational change in school settings?

Does the delivery design take into account the general types of barriers and constraints identified in Chapter Four?

Identification of procedures/arrangements and the selection of strategy/tactics

Have procedures and arrangements been specified for ensuring the compatibility of the planned EE program with the general educational goals and needs of the district or school system?

Have specific procedures or arrangements been devised for: (1) gaining school board, district administration, and principal support; (2) developing and carrying out program management activities; (3) developing classroom relevant EE curriculum content; (4) developing and carrying out instructional and learning activities; (5) assessing learner outcomes?

Has a plan, timeline, schedule, or sequence of events been established for developing and implementing the EE curriculum development, program management, and evaluation components? Is this plan reasonable in the light of available resources, staff, and teacher skills?

Have the various program requirements been examined in terms of their relative importance and likelihood of being achieved?*

*See the tradeoff analysis considerations, Chapter Five, Table Three.

Have the criteria been selected for evaluating the effectiveness of the various delivery strategies,* i.e., for assessing whether or not delivery activity and operations performed as expected or were as efficient as they could be?

Does the delivery design take into account the general types of delivery strategies and tactics presented in Chapter Five?

Providing answers to these general questions should become an integral part of the process of evaluating the adequacy of the design of an EE program and its delivery system.

C. General Questions for Assessing the Overall Quality of the EE Delivery System Design

In addition to assessing the adequacy of the EE delivery system design, it may be necessary to apply specific assessment criteria to ensure the overall quality of the design and its appropriateness to the conditions, needs, and priorities found in a district or school setting. We offer the following example criteria for your consideration:

Adequacy and relevance

Does the EE delivery system address the concerns and needs of the various stakeholders, i.e., teachers, program or project staff, school principals, district administrators, and other key personnel?

Is there a stable demand or need for the EE program activities being planned?

Do the planned EE curriculum content and student learning objectives support or enhance the current and standard curriculum goals, learning objectives, and instructional practices of the classroom teachers?

Are the planned EE delivery activities appropriate for reaching the expected objectives?

Does the delivery design take heed of the critical conditions, barriers, and constraints presented by the district or school setting?

---

* See the Decision Tree for Strategy Selection and Evaluation, Chapter Five, Figure 2.

Does the design take advantage of the types of district, community, university or college, state or federal agency support and assistance that are available to facilitate EE delivery?

Necessity and sufficiency

Does the delivery system appear to be comprehensive and thorough, i.e., does it address the critical "delivery concerns" presented in this Procedural Guide as well as those perceived as important by the various stakeholders?

Does the design provide for alternative strategies, tactics, procedures, or arrangements for overcoming barriers to delivering and institutionalizing EE?

Internal consistency

Does the design represent a sufficient level of agreement among program or project staff regarding the desired outcomes of the delivery process, i.e., desired EE curriculum content, desired student learning outcomes, desired strategies or methods of program development and implementation?

Feasibility of implementation

Would any of the program requirements or delivery strategies be technically or economically unfeasible to implement in the district or school?

Does it appear that the program requirements or delivery strategies may meet with resistance due to some other factors, e.g., competition for money, resources; lack of interest, motivation?

Utility

Is the delivery design perceived as useful by program staff and teachers as a guide in developing and implementing an EE program?

Does it appear that the delivery design will facilitate or make more efficient the program staff's and the teachers' efforts to develop and implement an EE program?

Clarity

Is the EE curriculum or program delivery plan clear and understandable to teachers, principals, district administrators, others?

Elegance

Does the delivery design appear to achieve a relative economy of means while, at the same time, coping with the complexity of the delivery problem?

As with the general adequacy questions, the application of these overall quality criteria to the assessment of the EE delivery design should be looked at as a necessary and vital part of the process of designing an EE program and its delivery system.

The application of both the general questions and criteria are necessary in order to know how well the EE delivery system has been designed. Such knowledge may give personal satisfaction, but it does a bit more. It gives confidence that decisions about activities and actions are likely to be wise ones. It gives those supporting or financing sources confidence in their judgments about giving such support. It provides a basis for developing and increasing trust in the design group's competence to make program decisions and to carry out the process of implementing the desired EE curriculum and program.

SUMMARY

As described in the previous chapters, designing an EE program and its delivery system involves the application of specific design operations to a complex set of program development and delivery variables. The design operations were presented as a general sequence of steps, as follows:

> Specify an ideal EE curriculum content unencumbered, for the time being, by considerations of actual conditions in a particular educational setting.
>
> Specify a set of program requirements (e.g., institutional support, instructional resources, management procedures, teacher preparation) for delivering this ideal EE curriculum in the chosen educational setting.
>
> Examine the chosen educational setting and identify specific constraints and barriers that would prevent or inhibit the development and implementation of the ideal EE curriculum, i.e., prevent the achievement of the program requirements.
>
> Do a tradeoff analysis between the importance of the program requirements (in actualizing the ideal EE curriculum) and their achievability given current and anticipated constraints and barriers.
>
> Select or devise alternative strategies, tactics, procedures, arrangements for achieving the program requirements and overcoming barriers, as well as for modifying the curriculum or program ideals to accommodate constraints.
>
> Implement (try out) the planned program delivery strategies.
>
> Evaluate the success of the delivery strategies in implementing the EE program and achieving program goals; based on the results, either revise or modify the program ideals and goals further or select alternative strategies and re-attempt to implement the program as specified.

Describing this sequence of steps in more general terms, we can say that: specifying an ideal EE curriculum is a PURPOSING activity designed to establish the general parameters of the EE program that will be delivered. Specifying program requirements is a PLANNING activity designed to set conditions under which program goals will be achieved. Identifying constraints and barriers, doing a tradeoff analysis, and selecting appropriate delivery strategies are

PROGRAMMING activities designed to specify ways to implement the various aspects of an EE program. The last two steps--IMPLEMENTING and EVALUATING--are on-going activities that carry out and assess program delivery activities.

Each step in the design sequence is an on-going and iterative process in that EE program staff must continually engage in design, development, implementation, evaluation, revision, and re-design activities as the EE program progresses through various stages of mobilization, implementation, and continuation.

It is hoped that the utlization of this Procedural Guide by educational practitioners will assist them to become more aware and to understand better the various requirements for an EE delivery system, as well as the operations necessary to design and implement an EE delivery system within a selected school system.